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一个用于大位移大转动非线性动力计算的显式梁元

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A BEAM ELEMENT WITH EXPLICIT ALGORITHMS FOR LARGE DISPLACEMENT AND LARGE ROTATION DYNAMIC ANALYSIS

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摘要

为了数值模拟建筑结构倒塌过程中的梁柱构件，建立了一个具有大位移大转动非线性动力计算能力的显式梁元。该梁元基于显式有限元单元理论，采用更新拉格朗日列式，考虑了转动的不可交换性，选用共旋(Co-Rotational)方法分离单元刚体位移和变形位移，通过应力更新算法来考虑材料的非线性。算例表明该梁元力学性能良好，具有一定的工程应用价值。

关键词： 显式梁元 几何非线性 非线性动力计算 大位移 大转动

Abstract:

In order to simulate beams and columns during the process of building collapse, a nonlinear beam element with explicit algorithms was studied. Based on the explicit finite element theory, the element adopted the updated Lagrange formulation, considered the non-swapable rotation and applied the Co-Rotational method to separate the deformation displacement and rigid displacement. The material nonlinearity was considered through the stress-update algorithm. The numerical result shows that the beam element used for the engineering numerical simulation has very good mechanical performances.

Key words: explicit beam geometrical nonlinear nonlinear dynamic analysis large displacement large rotation

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